Indian J. Phys. **51A**, 366–370 (1977)

Low and mid latitude total electron content observations during magnetic storms

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(*Received* 13 *December* 1976)

Many notable studies were made by various investigators on the morphology of ionospheric storms covering wide range of latitudes to understand the physical processes during these periods. making use of the total electron conten tdata derived from geostationary satellites. Multistation studies of individual storm effects were carried out by Klobuchar and Aarons (1968) Klobuchar *et al* (1971) and Mendillo *et al* (1974). Schodel *et al* (1974) studied a global pattern of TEC for the storm of 17 Dec. 1971. Recently the latitude dependence of the changes in TEC has also been studied by Lanzerotti *et al* (1975). In all these studies the most interesting observation is the TEC enhancement in the local afternoon and several theoretical explanations were put forward for the observed enhancements (Jones and Rishbeth 1971, Evans 1970 and 1973, Papagiannis *et al* 1971, and Mendillo 1973). Equatorial night time enhancement was reported by Yeboah-Amankwah (1976). In the present communication we compare the storm effect observed on TEC at a low latitude station Hawaii (21.3°N) with the mid latitude station Sagamore Hill Radio Observatory (42.6°N) data (Mendillo and Klobuchar 1974). We examined five individual storms of 1971 which effected TEC at both the above stations.

Storm 1 (figure 1a) SC occurred at 17:15 L.T. over Hawaii and at 16:23 L.T. over Sagamore Hill on 24 Feb. 1971. Immediately after SC there is a depletion of about 60% in TEC during the night at Hawaii whereas Sagamore Hill showed REC enhancement of about 130%. Hawaii continued to show enhancement (mostly) while Sagamore Hill showed a deep depletion around pre-dawn periods on 26 and 27 Feb. Recover6 in both cases is on 28 Feb. 1971.

Storm 2 (figure 1b). SC occurred at 11:00 L.T. over Hawaii and at 15:19 L.T. over Sagamore Hill on 12 Mar.1971. In both cases there is enhancement in TEC of about 70-80% immediately after the S.C. In case of Sagamore Hill there is a strong night (12-13 Mar.) depletion of about 60% where as Hawaii continued to have TEC enhancements upto the afternoon on 13 Mar. Later it showed a negative storm effect till it recovered to normal condition. In the case of Sagamore Hill night time depletions and afternoon enhancements are common on 13 and 14 Mar. Storm effect subsided on 15 Mar. in both cases.

Storm 3 (figure 1c) SC occurred at 17:00 L.T. over Hawaii and 18:12 L.T. over Sagamore Hill on 16 May 1971. Following SC both indicated TEC enhanco-

ment during the night. Hawaii showed a depletion throughtout 17 May with a peak of 80% around the local noon. From mid night to 14 hours on 18 May

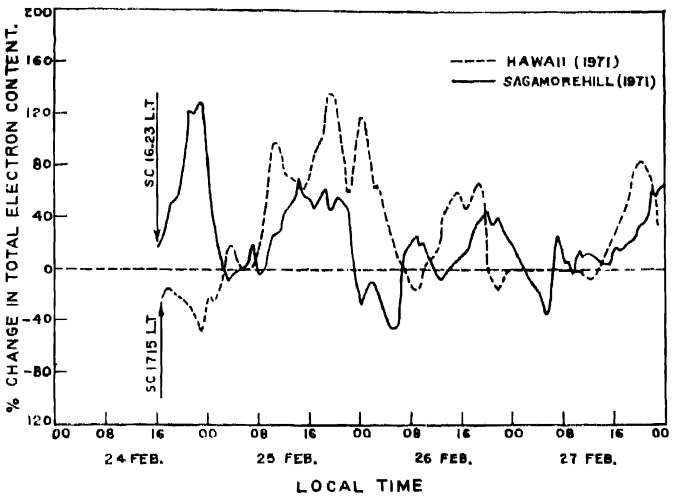

Fig. 1a. Percentage change in TEC from the mean during geomagnetic storm 1.

there is enhancement which is followed by a depletion again. Sagamore Hill showed more or less negative storm effect with a maximum peak around the predawn period on 18 May. The recovery in both cases is on 19 May 1971.

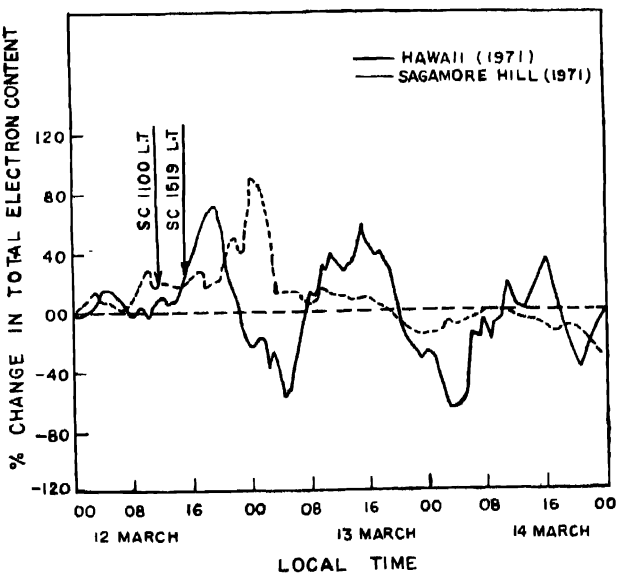

Fig. 1b. Same as figure 1.a except the data for storm 2.

Storm 4 (figure 1d). SC occurred at 08:30 L.T. on 21 Nov. over Hawaii and at 13:17 L.T. on 22 Nov. over Sagamore Hill. Hawaii showed mostly enhancement till the afternoon on 22 Nov. However, there are depressions of short

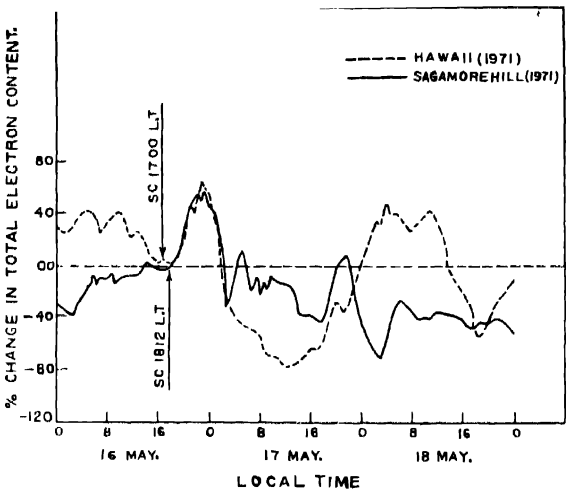

Fig. 1c. Same as figure 1.a. except the data for storm 3.

durations at 18 hours on 22 Nov.; 08 hours on 23 and 24 Nov. There is an unusual enhancement of more than 200% both on 23 and 24 Nov. in the afternoon periods and the storm continued with similar reduced features till 26 Nov. before it came

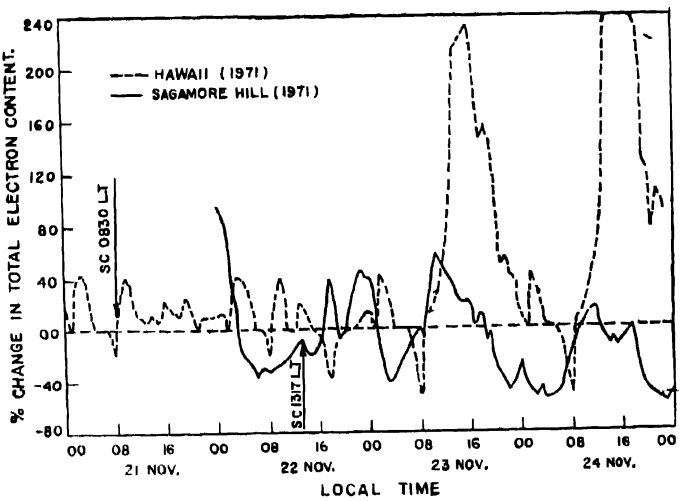

Fig. 1d. Same as figure 1.a except the data for storm 4.

to normal. Being a low latitude station the recovery in this particular case is very slow. In case of Sagamore Hill there is a large enhancement with a sudden

decrease prior to the SC and night enhancement on 22 Nov. From mid night to dawn on 23 Nov. there is depression and is followed by afternoon enhancement. From 23 Nov. night onwards it showed mostly depression till it recorded to normal condition on 25 Nov. Recovery is more rapid in this case. Another major difference in this storm effects on these stations is a strong enhancement at Hawaii on 23, 24 and 25 Nov. whereas Sagamore Hill indicates depression during these periods.

Storm 5 (figure 1.e). SC occurred at 03:45 LT over Hawaii and at 09:35 LT over Sagamore Hill on 17 Dec. 1971. In the case of Hawaii there is a large enhancement in TEC prior to SC, perhaps associated with a minor storm on 16 Dec. 1971 at 0830 LT. The storm effect at Hawaii is mostly positive on 18 and 19 Dec. with a rapid rate of change in the fore-noon hours, before it came to normal, except a deep sudden depletion at 14 hours on 17 Dec. In case of Sagamore Hill an intense enhancement of about 23% in TEC occurred followin SC and a deep depletion around the mid night on 17 Dec. Later it continued to be negative storm effect for the rest of the period till it recovered to normal on 20 Dec.

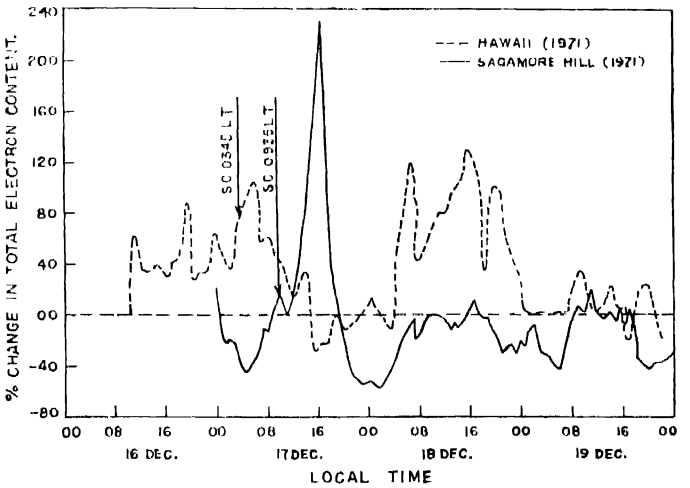

Fig. 1.e. Same as figure 1.a except the data for storm 5.

We conclude to say that major differences and similarities are explained for individual storms observed on low and mid latitude stations. We observed night time depletions immediately after SC for storms occurring after 15 hours, L.T. in low latitude stations whereas night time enhancements are reported at equatorial stations (YeBoah-Amankwah 1976). It may be noted that there were no TEC enhancements at Hawaii during nights whereas Arcibo indicated TEC enhancement (Lanzerotii *et al* 1975.).

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(*See* Rule 8)

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2.	Periodicity of its publication	Monthly
3.	Printer's Name	Sri Haradhan Chakrabarti
	Whether Citizen of India (If foreigner, state the country of origin)	Indian
	Address	Eka Press, 204/1, B.T. Road, Calcutta-700035
4.	Publisher's Name	Sri Samarendranath Sen
	Whether Citizen of India (If foreigner, state the country of origin)	Indian
	Address	Registrar, Indian Association for the Cultivation of Science, 2 & 3, Raja Subodh Mallick Road, Jadavpur, Calcutta-700032.

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